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U.S. Nuclear Regulatory Commission  
Washington, DC 20555

May 2, 2018

Subject: Transforming the Reactor Oversight Process to a New Paradigm

Dear Chris:

We are seeing a growing interest within the NRC in transformative ideas, among them the notion of transformative changes within the Reactor Oversight Process (ROP) known by the euphemism "ROP 2.0". Transformation of the regulatory oversight processes is paramount to the future of both the operating fleet and the next generation of nuclear energy. In that spirit, this NRUG<sup>1</sup> letter transmits a report proposing a paradigm shift that would transform the ROP to a new level of efficiency and effectiveness in achieving the mission of both the NRC and the industry. This report is not a comprehensive set of solutions but a new way of thinking to spur further ideas and transformative changes. This transformation requires a new way of looking at NRC oversight from the current punitive, backward-looking perspective on licensee problems to a more constructive, forward-looking approach. We believe this forward-looking approach would reinforce the strong culture of corrective action and continuous learning that is the hallmark of today's nuclear energy industry. Moreover, this approach would enable both NRC and licensees to align on the regulatory response to lapses in performance more quickly and efficiently than happens in today's backward-looking paradigm.

The present ROP has contributed to the improvement and sustained excellent performance of the operating fleet of nuclear reactors. The current framework of the ROP has been proven with almost 18 years of experience, however the performance of the industry is in a very different place than it was in the early 2000's. We think it is time to consider rethinking the framework of the ROP. The attached report offers a new paradigm with which to begin that rethinking – by looking at inspections and "infractions" with a forward-looking emphasis, not a backward-looking view.

We look forward to discussing this topic with the NRC and appreciate the NRC's willingness to engage. I hope this can be the start of a free-flowing exchange of ideas to make ROP 2.0 a reality.

Sincerely,

Greg Halnon  
Chairman, NRUG

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<sup>1</sup> The National Regional Utility Group (NRUG) is the central organization representing each of the nuclear licensees in the 4 NRC Regional areas. Each NRC Region has a chartered RUG to assemble licensees from the regulatory groups one each nuclear site, allowing benchmarking, sharing of operating experience, and sharing resources.

# The Future of Nuclear Regulatory Oversight of Operating Reactors

## THE NEED

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Conversations are taking place regarding the future of regulatory oversight of the nuclear industry.<sup>1</sup> These conversations arise from concerns about the ability of the industry and the NRC to adapt to new technologies, new information on safety margins, and new imperatives to focus on the most risk-significant activities at operating plants. The current approach to regulation hinders the industry from adopting new technologies that could improve safety, such as digital instrumentation and controls that are widely used in other fields as demanding as nuclear energy generation. Besides hindering the adoption of technological safety improvements, the current approach to regulatory oversight is more burdensome and costly to taxpayers and ratepayers than it needs to be. The industry's survival needs a modern approach to regulatory oversight of operating reactors.

On the industry side, there are at least four categories within the industry, each with a distinct set of concerns to consider in these conversations. One category is the present fleet of large light water reactors. The strong performance of this group has created a substantial body of operating experience – totaling more than 2000 reactor-years since the Reactor Oversight Process (ROP) was launched – that provides a solid basis for reforming the NRC's approach. A second category comprises owners and vendors involved in construction of new large light water reactors, such as the Westinghouse AP-1000 units at Southern Nuclear's Vogtle site. This group is cutting its teeth on NRC's challenges in overseeing new construction under 10 CFR Part 52 and, in a few years, reactor startup. A third category consists of companies offering light water reactors in small modular designs and those energy producers interested in building these designs at their sites. This group is challenging NRC's ability to learn from the large light water experience and better risk-inform regulations as appropriate to the leaps in safety margin offered by these innovative designs. The fourth category is the most diverse and includes the wide range of advanced reactor technologies of various visions and designs going beyond conventional light water physics. This group is challenging the NRC's thinking and resources outside its range of historic expertise and regulation. While the operation of this group is years away, it is appropriate to consider them when testing proposed changes in the ROP.

Fundamentally, the NRC's regulatory approach is sound and has served the purpose of safety improvements over the years. For more than 40 years, the NRC and the industry it regulates have ensured protection of the public health and safety. Now that nuclear technology, knowledge, and oversight has matured over the last four decades, it is time to adapt to a more effective and efficient oversight model for the future. Additionally, proposals to reform regulation of the nuclear industry must preserve the incentives afforded industry to pursue prompt and effective corrective action when regulatory issues arise. In addition, proposals on reform must also preserve the NRC's ability to provide

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<sup>1</sup> Key among these are the NRC's January 2018 announcement of the formation of an NRC Transformation Team (ADAMS ML18029A106, ML18029A251) and the industry's response, a set of recommendations to feed into the NRC's transformation project (letter from Pamela Cowan (NEI) to Dan Dorman (NRC), March 16, 2018).

objective, independent oversight and improve on the efficiency with which NRC and industry apply their resources to protect the health and safety of the public.

This paper defines a necessary paradigm shift from the present construct of the ROP which looks back in time to determine safety significance to a more forward-looking construct where licensees are encouraged to return elevated risk situations to baseline risk in a timely and complete manner. The principle behind the characterization of licensee inspections, findings, and violations and the requisite Agency response changes to apply resources more appropriately for present-day safety benefit. This benefit applies to all four industry categories and more importantly, public health and safety. The new construct can be used as a cornerstone or platform for future revisions and enhancements to the reactor oversight process.

## THE PROBLEM

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Under the present ROP, an inspection finding or violation is characterized through a significance determination process (SDP). This process requires NRC and licensee resources to thoroughly, and as accurately as possible, characterize the risk significance of an issue to determine the appropriate NRC response. The NRC response can range from continued monitoring under the baseline inspection program to a deeply probing and rigorous supplemental inspection such as the very comprehensive Inspection Procedure 95003.

The SDP analysis looks backward in time to assess the risk-significance of the lapse in licensee performance<sup>2</sup> in the context and conditions that existed when the lapse occurred. The resource-intensive SDP analysis focuses on the specific details of the lapse in performance, how long it endured, and the effect on the risk of core damage had it remained uncorrected. The analysis ignores important aspects of the plant's response to the lapse in performance, such as operator proficiency, prompt evaluation, correction, and compensatory actions. The analysis also ignores the new state of core damage risk after those actions are taken (i.e., "forward- risk").

The resources expended for the SDP analysis typically involve subject matter experts and risk assessment experts for both NRC and the licensee. These resources are expended solely on looking back, trying to determine what the risk was when the lapse in performance occurred. Resources thus spent on the SDP are primarily about adjudicating the past, not improving the present level of risk of the plant. The ultimate result of the present construct is to determine what the level of inspection (and other potential enforcement) should be going forward and how to communicate the risk significance of the finding to the public.

Presently, the NRC imposes a 120-day time limit<sup>3</sup> in which to complete its final significance determination. Often the inspection occurs months after the violation occurred and more often than not, long after the violation has been corrected.

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<sup>2</sup> This paper uses the term "performance deficiency" as a general label for any lapse in licensee performance that requires licensee response and triggers NRC interest.

<sup>3</sup> Strictly speaking, the 120-day interval is an ROP program performance metric not a time limit. In practice, however, the 120-day interval is commonly treated as a de facto time limit on completing the SDP.

If the SDP result is an escalated risk finding, then a follow-up supplemental inspection results. Usually, the supplemental inspection occurs at the earliest within 3-6 months, and sometimes up to a year or more after issuance of the initial inspection report that documents the issue (which comes 45 days after the SDP is complete). The supplemental inspection ensures the corrective actions were effective in fixing the issue and extent of condition/cause is evaluated and addressed. All this time, the efforts of both the NRC and licensees are expended to accurately characterize an issue that may have occurred well over a year or more in the past. This potentially extensive reverse-looking effort ultimately solely determines the level of inspection in response to the past violation.

## THE SOLUTION

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The adjudicatory side of the ROP, primarily the SDP, needs a new paradigm. The new approach should shift resources from characterizing the risk significance of a past moment to ensuring the plant was restored to its baseline risk level promptly. This shift in thinking is to encourage prompt identification, evaluation, and correction of violations and findings.

In this forward-looking paradigm, the purpose of the SDP would be to *generally* characterize risk significance by considering actual, objective circumstances that existed while the plant risk was elevated. The new approach would realistically credit actions that shorten the time in which the risk is above baseline (during the correction phase). The NRC response would be highly influenced by the time the plant remains at elevated risk. This could be because the event was complex, and response was not as desired or licensees do not understand the cause and institute weak or symptomatic compensatory measures prior to implementing final corrective actions. Higher credit would go to plants that quickly correct the issue, both to those who have effective event response and those who take positive, deliberate actions to correct, mitigate or compensate for the violation.

The resource focus should be on forward-looking risk mitigation and correction, rather than backward-looking and detailed characterization of risk using “what if” scenarios and hypothetical circumstances. The key question is where resources would be better spent: trying to establish a historical risk number to the ten thousandth of a decimal, or in real-time correction and returning of the plant to baseline risk or better. Hence, the proposal is to change the purpose and method of characterization of findings and establish a response scheme based on the timeliness and completeness of the licensee response.

Many ideas will surface when one considers this paradigm shift. In a conversation at a regional meeting, one NRC executive suggested that Green findings and Non-Cited Violations (NCV) not be documented in the inspection report. Instead, the NRC could let the licensee’s corrective action program correct the issue commensurate with all the other tasks being driven by CAP. This allows the very low safety significant items to be prioritized with other site resource tasks. Another idea is to characterize findings without colors or threshold, but based on impact, from least to highest severity: 1) compliance issue with no impact to operations, 2) potentially consequential to operations with compensatory actions in place, 3) ongoing potentially consequential to operations. The following additional recommendations also exemplify this new paradigm.

## ILLUSTRATIONS

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The narratives below illustrate how the paradigm shift could lead to a new approach to inspections and the Agency's response to issues, findings, and violations.

### **Example 1: Inspections**

The recent Holistic Review of Engineering Inspection Procedures project led by the NRC included a proposed credit for licensees doing a robust self-assessment.<sup>4</sup> Per the staff's proposal, the licensee could perform the self-assessment, and the NRC would credit the work in place of one focused engineering inspection that would otherwise be performed by NRC staff. This is an example of the new paradigm that encourages licensees to develop and maintain a strong culture of self-identification and assessment. This proposal aligns with the thinking of an inspection construct that encourages and credits strong licensee performance on focusing on resolution of identified issues promptly and comprehensively.

### **Example 2: Finding Categorization and Follow-Up**

The industry and NRC struggle with communicating complex regulatory issues to the public, which tends to be less informed about risk concepts, key terms and plant technical details needed for context. The present four-color scheme in which the ROP casts inspection findings and performance indicators is an effort to visually communicate the significance of findings. However, experience over the life of the ROP has shown that any finding of greater than baseline risk (i.e., colored white, yellow, or red in the ROP terminology) grabs the attention of the public as well as that of politicians and activist groups. This is due, in part, to the natural comparison of those colors to the distinctions of everyday life, like the green-yellow-red scheme of the common traffic light. It is also a natural result of the rarity of findings of greater-than-baseline-risk resulting from improvements in plant performance over the life of the ROP.

The perceived stark differences in colors are at times exploited by anti-nuclear activists and cause burdensome public relations issues for utilities and the NRC. In addition, the rarity of these elevated risk situations leads to an erroneous sense of enterprise risk among financial analysts and other observers. Hence, the above proposed scheme of labeling a finding would serve public communication in clearly providing a basis for the NRC response and remove the tangential consequences by highlighting a focus on safety through prompt resolution of the issue.

### **Example 3: Use of Corrective Action Process for Documenting Inconsequential Findings**

Recently, a few proposals have been discussed. Additional proposals have also resulted from socializing this paradigm shift. One idea discussed was to eliminate the White finding category in the ROP. Another idea already mentioned is to stop documenting Green findings and NCVs in the inspection report and allow the resident inspector to follow up as part of routine corrective action program (CAP) monitoring. Both would save resources and time spent on tangential issues and minimize confusion in the public domain. Additionally, as already mentioned, this allows the very low safety significant items to be prioritized with other site resource tasks.

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<sup>4</sup> NRC's proposals for reform of engineering inspections have not been formally published yet. This characterization summarizes information presented orally by the NRC staff in recent public meetings.

Another way to build on the above two ideas is to consider eliminating all colors of findings and document only findings that have potential to impact operations. All findings and violations, whether documented in inspection reports or not, have corrective action plan follow up documented in the licensee's CAP. To assist in determining which category findings are in, the NRC could do an MD 8.3-type evaluation<sup>5</sup> on each finding and determine the NRC response. The response would be one of the existing team inspections on the list of response tools in MD 8.3 that includes Special Inspections (SIT), Augmented Inspections (AIT), and Incident Inspections (IIT). This response would eliminate the IP 95001, 95002, and 95003 inspections, but the contents of these inspection procedures might be incorporated into the new regime of response inspections.

There was a total of nine escalated findings in 2017 (all white). The burden to document the details of these and do an MD 8.3-type evaluation to determine NRC response would be much less than in today's approach. Additionally, since the corrective plan and schedule are being (and would still be) documented in CAP, the licensee would benefit by being aggressive in minimizing the length of the schedule and attempt to have the matter corrected in time so that the inspection report can state the issue has been resolved.

#### **Example 4: Roll-off of Inspection Findings**

If the present regime of inspection findings and violations is maintained, then an opportunity to encourage licensees to promptly evaluate and resolve issues exists within the Action Matrix itself. The licensee who performs a prompt causal evaluation that explores the extent of condition and extent of cause as well as implementing a deliberate and strong set of actions to prevent recurrence, then maintaining the plant in an elevated risk category which does not reflect the actual risk of the plant is unnecessary. When the plant returns to baseline risk, there is no incremental benefit to safety to maintain increased oversight beyond that provided by the resident inspector unless a deeper organizational issue is identified. In this case, the NRC would consider a ROP deviation or focused inspection on the issue at hand. Hence, removing the plant from elevated oversight as soon as the appropriate inspection confirms the plant has returned to baseline risk is a way to encourage plant licensees to focus on the forward-looking risk of the plant rather than diverting excessive resources into determining what the risk was, or could have been. The public benefits from the plant returning to baseline risk or better in a more prompt and complete fashion and keeping the focus of resources on promptly returning the plant to baseline risk.

#### **Example 5: Emergency Planning (EP) – actual versus potential consequences**

The EP SDP determines that if an actual evacuation order was implemented by the local offsite Radiological Emergency Plan (REP) organization due to an over-classification by the licensee ERO, the finding would be Yellow and warrant a comprehensive 95002 inspection (Column 2). Likewise, if a procedure error was discovered dealing with risk significant planning standard and no consequence resulted, the same Agency response is given. These two situations (causing an actual population evacuation versus simply discovering an error in a procedure that never had to be implemented) are not comparable. Hence, under the proposed labeling idea, the "Failure to Comply" finding would be classified as a "compliance finding with no impact to operations" because the error would be fixed

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<sup>5</sup> This refers to the NRC Management Directive by which the agency determines the level of immediate response to be given to plant incidents. The MD 8.3 framework provides a risk-informed decision-making process for this purpose.

almost immediately. If the error was not fixed, then the finding would be potentially consequential causing an escalation in the Agency response going forward. As should be recognized, the scheme encourages prompt resolution of the error. There are similar analogies that can be made with the Security SDP.

## THE NEXT STEPS

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The time has come to look for opportunities to transform the ROP. One place to start is rethinking the paradigm of the SDP. Industry believes that a shift in thinking that focuses on promptly returning the plant to baseline risk and encourages prompt and comprehensive corrective action would be beneficial to public safety. This shift in thinking could also help alleviate the pressure both licensee and NRC staff resources feel to prove exactly what the quantitative state of plant risk was during the occurrence. Instead, both licensee and NRC staff could focus on understanding the current risk and encouraging prompt corrective actions to get back to baseline risk as quickly as possible.